

putrified, or in powder ; and yet some part will remain, which it is very difficult to take out from the twisted canals, especially in those sponges of the *tragos* kind, so hard to cleanse. In a word, the blood or humours, which the ancients have observed, is no other than the mucilage or juice of the substance of these worms.

Dated at Guadaloupe,
1 March, 1757.

LXXIX. Account of an Experiment, by which it appears, that Salt of Steel does not enter the Lacteal Vessels ; with Remarks. In a Letter to the Rev. Tho. Birch, D.D. Secr. R. S. By Edward Wright, M. D.

S I R,

Read Mar. 2,

1758.

TH O' iron is universally allowed to be one of the most powerful medicines now in use, yet many physicians observing, that the *fæces* of patients, who used it either in a metallic or saline form, were tinged of a black colour, have been led to think, that, in a metallic state, it could not be reduced into particles fine enough to be received by the lacteal vessels ; and if taken in a saline form, that it underwent a precipitation in the intestines, by which, being reduced to an earth or calx, it was in like manner rendered incapable of making its way into the blood. But the accurate experiments, with which Signor Menghini has favoured

the public in the Memoirs of the Bononian Academy *, sufficiently prove, that the ore and filings of iron, finely levigated, enter the blood in considerable quantity ; as does also the *crocus*, *calx*, or earthy part of the metal, tho' in less proportion than the two former, which were found to act with a violent *stimulus* on the vessels, and to have dissolved and broke the *crasis* of the blood of different animals, that had used them for some weeks in large doses mixed with their ordinary food. Tho' it must be allowed, that these experiments are very curious, yet the subject seems to require a further inquiry, viz. *Whether iron is capable of entering the blood in a state of solution, or under a saline form* : for, from the violent *stimulus*, as well as from the dissolution of the blood, and other symptoms brought on by the use of the ore and filings, these substances (not being properly dissolved) appear to have acted in a manner so grossly mechanical, that, whatever Signor Menghini may think, very little is to be concluded from them, with regard to the action of iron on the human body, in such cases, as indicate its use, and where a rational physician would think proper to prescribe it as a medicine.

Having read Signor Menghini's memoir, I recollect, that in the year 1753 I had, with the assistance of two friends, made the following experiment, in order to discover, whether iron, in a saline form, is capable of entering the lacteals.

An ounce and a half of salt of steel dissolved in a sufficient quantity of water, filtrated and mixed with

* Vincentius Menghinus *de Ferrearum particularum progressu in Sanguinem. Comment. Acad. Bonon. T. II. P. 2. pag. 475.*

about a pound of bread and milk, were forced down the throat of a dog, that had been kept fasting for 36 hours. An hour after he had swallowed this mixture, having secured him in a supine posture, as is usual in such experiments, we opened the abdomen, and observed the lacteal vessels, like white threads, running along the mesentery in a very beautiful manner. Upon slitting open part of the small guts, we there found a good deal of the mixture, which appeared frothy, but without any black colour, or the least sign of the salt being precipitated; and struck a deep inky colour with infusion of galls. Tho' the white colour of the lacteals convinced us, that they were full of chyle, yet, as it would have been impossible to have collected a sufficient quantity of it from them, we found it necessary to open the thorax, and tie the thoracic duct a little above the receptacle, which, from the ligature, soon became turgid, the animal being alive and warm, and the chyle still continuing its course towards the thoracic duct. Having cut open the receptacle, we easily collected a sufficient quantity of chyle, and immediately mixed therewith, drop by drop, infusion of galls; a very simple and easy method, by which an incredibly small quantity of salt of steel may be discovered in most liquors: but not the smallest change of colour was observed, tho' they were rubbed together for some time, and allowed to stand several hours. Now had there been a single atom (so to speak) of the salt in so small a portion of chyle, as that used in this experiment, which was, as near as I could guess, somewhat less than half an ounce, it is not to be imagined, that it could have failed to discover

discover itself by this method of trial ; for upon adding one fourth of a grain of the salt, this mixture instantly became of a bright purple : and I have found, by other experiments, that the smallest quantity of salt of steel shews itself as readily in the chyle by galls, as in any other liquor of the same consistence.

This experiment (which was as fair as could have been desired), together with another observation I have made, *viz.* that neither the blood nor urine of patients, during the use of salt of steel, in the least change colour with galls, renders it more than probable, that this salt *does not enter the blood.*

As the salt was found to have undergone no change in the small guts, it appears, that it is not prevented from entering the lacteals by its being decomposed or precipitated, as has been imagined ; but, on the contrary, that what renders it incapable of being received by these vessels, is its *astringency* : for the lacteals seem to be endowed with that admirable faculty of admitting such particles of pure chyle as they happen to be in contact with, and of accommodating their diameters to them, at the same time that by their natural irritability, and power of constriction they obstinately exclude such as are astringent ; which, were they to enter the lacteals, would either produce dangerous obstructions in these vessels, or, if they got into the blood, would occasion polypous concretions in the larger vessels, or coagulations incapable of being transmitted thro' the minute vessels of the lungs ; the effects of which would be either sudden death, or at least inflammations and suppurations from obstructions in the pulmonary vessels ; inconveniences, which

which nature, by precluding astringents from entering the lacteals, has carefully and wisely avoided.

Salt of steel, taken internally, must retain its astringency until it be precipitated; which can scarce ever fail to happen in the great guts, from the putrid *fæces* they contain, which are always observed to be tinged of a black colour from the metallic basis of the salt, part of which, as it has little or no astringency, may, no doubt, enter the blood, as Signor Menghini observed of the *crocus*, which is the same substance; and we know, from the experiments of Lister and Musgrave †, that particles much grosser than those of the white chyle, provided they be not astringent, or very acrid, are conveyed by the lacteals. But the metallic basis being separated from its acid, and thus reduced to a mere calx or earth, can scarce be supposed to have any medicinal quality whatsoever, or at least to have any share in the virtues justly attributed to salt of steel.

As this salt is not only astringent, and consequently a strengthener, but at the same time acts with a gentle *stimulus*, all its virtues (which are known to be very great in diseases, where the fluids are either viscid, cold, and phlegmatic, or dissolved and watery, from a laxity of the solids) may be accounted for from its immediate effects on the stomach and *primæ viæ*, and on the system of the solids in general by consent; which it would be needless to illustrate by similar examples, because well known to every one the least versed in medical studies. I shall therefore only beg

† Phil. Transact. by Lowthorpe, vol. iii. p. 102. edit. 1749.
the same by Jones, vol. v. p. 259.

leave,

leave, from the obvious qualities of this medicine, and from what has been observed above, to deduce the following corollaries.

1. That salt of steel has no deobstruent or aperient virtue by any immediate action, that it can possibly have on the blood, or other animal fluids, as some have imagined; but that, on the contrary, it owes this quality to its *not entering the blood*, which it would otherwise coagulate, and to its *action on the solids alone*.

2. That in diseases proceeding from a laxity of the solids, great care ought to be taken to restore and invigorate the *prima via*; since a medicine (and this we may presume not the only one) whose immediate action is confined to those parts, is yet found by experience to produce so salutary effects in such diseases.

3. That as this salt does not enter the blood, and consequently cannot be in danger of too much stimulating or constricting the vessels, on which it only acts by consent, it may, in small doses, be successfully used in many cases, where it has been imagined to be hurtful, particularly in consumptions of the lungs, so frequent and fatal in this island; which are commonly attended with too great a laxity of the *prima via*, and of the solids in general, tho' they seem more immediately to proceed from a laxity and weakness of the pulmonary vessels; in which circumstances it must be of the utmost consequence to restore the tone of those principal organs of chylification, the *prima via*; as good chyle not only corrects the acrimony of the blood, which in the advanced stages of consumptions so much prevails, but likewise saves a great

a great deal of labour, which the lungs (already too much oppressed) must otherwise undergo from a crude and ill-concocted chyle. Agreeably to this we find, in the *Essays Physical and Literary* of Edinburgh *, two well-vouched histories of patients far gone in consumptions, with the usual symptoms of pain in the breast, cough, gross spitting of fetid matter, difficulty of breathing, hectic fits, and morning sweats, perfectly cured in a few weeks, by the use of the Hartfell-Spaw near Moffat; which, contrary to what is observed in most natural chalybeat waters, contains a fixed vitriol of iron.

These, Sir, are the few observations I had to make at present on this subject. I have taken the liberty to address them to you, in order, if you shall think proper, to be communicated to your illustrious Society; which, I hope, will continue to latest posterity those interesting researches for the advancement of every branch of natural knowledge, by which it has already acquired so much and so deserved honour; and am, with the greatest respect,

S I R,

Your most obedient humble Servant,

Strand, Feb. 28. 1758.

Edward Wright.

* Vol. I. art. xii. p. 364.